

WHAT IS CLAIMED:

1. Motor-driven compressor-alternator unit operating in mono-energy with compressed air or dual-energy, bi or tri-mode and featuring a piston stroke control system enabling said piston to be stopped at top dead center as well as an ambient thermal energy recovery device characterized by the means implemented together or separately, and more specifically:

- in that the pistons have two stages of diameter, featuring a large diameter cap (2, 2A) sliding in a so-called "working" cylinder (4, 4A) to ensure the motor function during expansion followed by exhaust, and the cap of which is extended by a second stage piston of smaller diameter (5, 5A) referred to as the compression and/or ambient thermal energy recovery piston, sliding in a cylinder to ensure the compression function.

- in that the second stage piston is used for the expansion function with work in the ambient thermal energy recovery system.

- in that commutation and interaction means are placed between the various cylinders rendering the motor function inactive during compressor operation and/or the compressor function during motor operation and/or to activate the ambient heat recover function during motor operation.

2. Motor-driven compressor-alternator unit according to claim 1, characterized in that heat exchangers (22E,23E,24E,25E) are fitted between each compression and/or thermal energy recovery expansion cylinder to cool the air flow during compression and to heat it up again during the recovery of ambient thermal energy.

3. Motor-driven compressor-alternator unit according to claim 1, characterized in that the diameters of the pistons (5,5A) and the ambient thermal energy recovery and compression cylinders (6,6A) of the same motor are different in order to obtain decreasing displacements in order to allow compression in several stages of decreasing volume and inversely of increasing volume when they are used for expansion in the case of ambient thermal energy recovery.

4. Motor-driven compressor-alternator unit according to claim 3, characterized in that due to the difference in the diameters of the compression pistons (5,5A), the diameters of the motor expansion pistons (3,3A) are proportionally different to obtain identical expansion piston surface areas for better regularity of the forces applied during the expansion.

5. Motor-driven compressor-alternator unit according to claim 3, characterized in that the weight of the pistons (1,1A) is identical to allow correct balancing of the reciprocating masses.

6. Motor-driven compressor-alternator unit according to claim 1, and featuring a control system of the piston at top dead center and one or more units of 2 opposed cylinders which balance each other, the lower arm of the pressure lever of which is extended by an essentially identical mirror pressure lever thus representing a single arm (12) with the pivot or fixed point (12A) more or less at its center thus forming two half-arms (12B,12C) featuring two pins (11,11A) at each of its free ends connected to the opposed pistons by the upper arms of the pressure levers (10,10A), characterized in that the axis of the opposed cylinders and the fixed point of the pressure lever (12) are roughly aligned on the same axis (X,X').

7. Motor-driven compressor-alternator unit according to claim 6, characterized in that the pin of the control rod (13) connected to the crankshaft is positioned on one of the two half-arms (12B) between the connecting pin with one of the upper arms of the pressure lever connected to the piston (1) and the fixed point or pivot (12A).

8. Motor-driven compressor-alternator unit according to claim 1, characterized in that the motor flywheel features means, integral with its periphery, enabling an electric motor (41,42) to be configured, electronically controlled to drive the unit in its compressor function powered by the household electrical power system used in homes.

9. Motor-driven compressor-alternator unit according to claim 8, characterized in that the rotation speed of the electric motor is controlled to enable operation at high speeds when the high pressure storage tank (25) is empty or filled very little and that little

torque is required for compressor operation and in that the rotation speed is slowed down as the tank fills up, in that the pressure increases and that the torque requested from the motor is increasingly large.

10. Motor-driven compressor-alternator unit according to claim 8, characterized in that the electric motor is equipped with means enabling on-board electricity to be produced during motor operation, for recharging the battery for example.

11. Motor-driven compressor-alternator unit according to claim 8, characterized in that the motor-driven alternator thus formed allows the unit to be started in its motor function by causing its rotation at least over one revolution.

12. Motor-driven compressor-alternator unit according to claim 8, characterized in that the motor-driven alternator occasionally participates in increasing the motor torque.

13. Motor-driven compressor-alternator unit according to claim 8, characterized in that the motor-driven alternator is used as a speed reducer and to recover electrical energy during vehicle decelerations and/or braking.

14. Motor-driven compressor-alternator unit according to claim 1, characterized in that the compressed air, before being introduced into the expansion chamber (15,15A), coming from the storage tank (25) either directly, or after passing through the ambient thermal energy recovery device, and before its introduction into the final use buffer tank (27), is channeled into a thermal heater (29) where, through an increase in its temperature, it will increase in pressure and/or volume before entering the expansion chamber, thus considerably increasing the possible performance characteristics of the motor.

15. Motor-driven compressor-alternator unit according to claim 14, characterized in that the thermal heater (29) uses fossil fuels enabling the operation of a burner (33) to increase the volume and/or pressure of the compressed air passing through it.

16. Motor-driven compressor-alternator unit according to claim 14, characterized in that the thermal heater (29) uses a solid-gas reaction type thermochemical process based on the transformation by evaporation of a reagent fluid contained in an evaporator (36), for example liquid ammonia in a gas which reacts with a solid reagent contained in a reactor (38), for example salts such as calcium, manganese, barium chlorides or others, the chemical reaction of which produces heat, and which, when the reaction is completed can be regenerated by inputting heat into the reactor to provoke the desorption of the gaseous ammonia which will recondense in the evaporator.

17. Motor-driven compressor-alternator unit according to claim 16, characterized in that the input of heat required to condense the reagent fluid is procured by the calories (41) dissipated during compressor mode operation in order to recharge the high pressure storage tank assisted by an electric heating element (40).

18. Motor-driven compressor-alternator unit according to claim 14, characterized in that a burner type heating system (33,32A) powered by a fossil energy is combined with a thermochemical heating device (36, 37, 38A).

19. Motor-driven compressor-alternator unit according to claim 18, characterized in that the burner (33), powered by a fossil energy, is used to regenerate the thermochemical heating device by providing the heat required by the reactor (38A) to cause the desorption of the gaseous ammonia which will recondense in the evaporator (36), and also to continue the heating process of the compressed air passing through the heater (29) by its finned (32) pipe (25).

20. Motor-driven compressor-alternator unit according to claim 1, characterized in that it functions in a standalone manner, without using the high pressure compressed air in the storage tank, by using compressed air supplied by one or more of the compression stages, according to the service pressures desired, the compressed air being then reheated in the heating system (29) which increases its volume and/or pressure, then is reinjected into the expansion chambers (15,15A) of the working cylinders to allow the unit to function by expanding and producing the power stroke.

21. Motor-driven compressor-alternator unit according to claim 20, characterized in that the exhaust air from the expansion cylinders (4,4A), is directed to the thermal heater (29) either directly, or through one or more compression stages where its temperature will increase resulting in an increase in its pressure and/or volume, then reinjected into the expansion chambers (15,15A) of the expansion cylinders to allow the unit to operate by producing the power stroke.

22. Motor-driven compressor-alternator unit according to claim 21, characterized in that a safety valve (21D) placed on the exhaust circuit allows said pressure to be controlled and released into the atmosphere in case of possible excess air.

23. Motor-driven compressor-alternator unit according to claim 20, characterized in that part of the compressed air, before being introduced into the thermal heater (29), is used in a by-pass, and/or other stages of the compressor are used jointly or not, to recharge the high pressure compressed air storage tank (25), during the operation of the unit in motor standalone mode as described in claims 20 to 22.

24. Motor-driven compressor-alternator unit according to claim 20, characterized in that it operates with bi-energy by using at low speeds, for city driving for example, zero pollution operation with the compressed air contained in the high pressure storage tank (25), and at high speeds, for highway driving for example, in standalone operation with its thermal heater (29) powered by a fossil energy, while resupplying the high pressure storage tank using one or more of its compression stages.

25. Motor-driven compressor-alternator unit according to claim 1, characterized in that it operates with three energy sources, for example, by using the zero pollution operation in city with compressed air from the high pressure storage tank (25), and the thermochemical heater (36, 37, 38A), then on highway with its thermal heater powered by fossil energy while resupplying the high pressure storage tank 25 using one or more of its compression stages, and by regenerating the thermochemical heater by inputting heat into the reactor (38A) to cause desorption of gaseous ammonia which will recondense in the evaporator (36).

26. Motor-driven compressor-alternator unit according to claim 1, characterized in that it operates with four energies, by using the electric motor (41, 42....) equipping its motor flywheel, either for performing maneuvers requiring little energy, or for occasionally increasing the power delivered, to go up a hill for example, or to pass, or even obtain better start boost.

27. Motor-driven compressor unit, according to claim 1, to produce household electricity or other, emergency power where, during a power outage, during a power grid failure for example, the motor-driven compressor is automatically switched to motor mode and, driven by the compressed air contained in the storage tank(s), it drives the motor-driven alternator which can be switched automatically to alternator mode to supply electricity.

28. Application of the motor-driven compressor-alternator unit, according to claim 1, to conventional 2-stroke, 4-stroke, diesel or applied ignition thermal engines, or to compressors driven by independent means.

29. Motor-driven compressor-alternator unit according to claim 1, characterized by the use of a conventional type crank lever system.